

CLAIMS

What is Claimed is:

1. A layered group III-N article, comprising:
 - a silicon single crystal substrate;
 - a single crystal zinc oxide (ZnO) buffer layer disposed on and in contact with said substrate, and
 - a single crystal group III-N layer disposed on said ZnO buffer layer.
2. The article of claim 1, wherein said group III-N layer comprises GaN.
3. The article of claim 1, wherein said group III-N layer is an epitaxial layer.
4. The article of claim 1, wherein a thickness of said ZnO layer is less than 200 angstroms.
5. The article of claim 5, wherein said thickness is less than 100 angstroms.
6. A light-emitting diode (LED), comprising:
 - a silicon (111) single crystal substrate;
 - a zinc oxide (ZnO) comprising layer on said substrate;
 - a single crystal group III-nitride semiconductor epitaxial layer on said ZnO layer,and

an active layer on said group III-nitride layer.

7. The LED of claim 6, wherein said ZnO layer is a single crystal.
8. The LED of claim 6, wherein said group III-nitride layer comprises GaN.
9. The LED of claim 6, wherein one terminal of said LED is contacted through said silicon substrate.
10. The LED of claim 6, further comprising a first and second cladding layer sandwiching said active layer.
11. The LED of claim 6, wherein said active layer comprises $\text{In}_x\text{Ga}_{1-x}\text{N}$, wherein $0 \leq x \leq 1$.
12. A method for forming group III-N based articles, comprising the steps of:
 - providing a single crystal silicon substrate;
 - depositing a single crystal zinc oxide (ZnO) layer on said substrate, and
 - depositing a single crystal group III-N layer on said ZnO layer, wherein at least a portion of said step of depositing group III-N layer is performed at a temperature of less than 600° C.
13. The method of claim 12, wherein said step of depositing said group III-N layer comprises depositing a seed layer at a temperature of no more than 600° C, followed by a step of depositing another portion of said group III-N layer at a temperature of more than 600° C.

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14. The method of claim 12, further comprising the step of treating said ZnO layer with a gallium comprising gas before said step of depositing said group III-N layer.
15. The method of claim 14, wherein said gallium comprising gas comprises triethyl gallium.
16. The method of claim 12, wherein said group III-N layer comprises GaN.
17. The method of claim 12, wherein said group III-N layer is an epitaxial layer.
18. The method of claim 12, wherein a thickness of said ZnO layer is less than 200 angstroms.
19. The method of claim 12, wherein said step of depositing a zinc oxide (ZnO) layer comprises pulsed laser deposition.